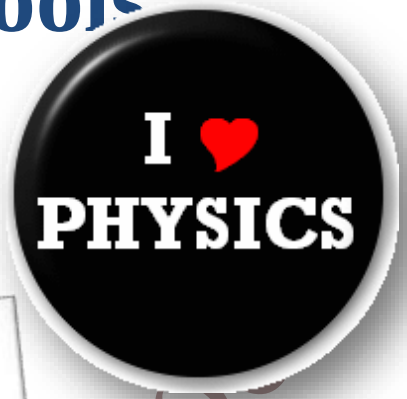
Geel 2000 Language Schools

Science Department



1st secondary

Physics

2022 / 2023

Name: ……

Class: ……

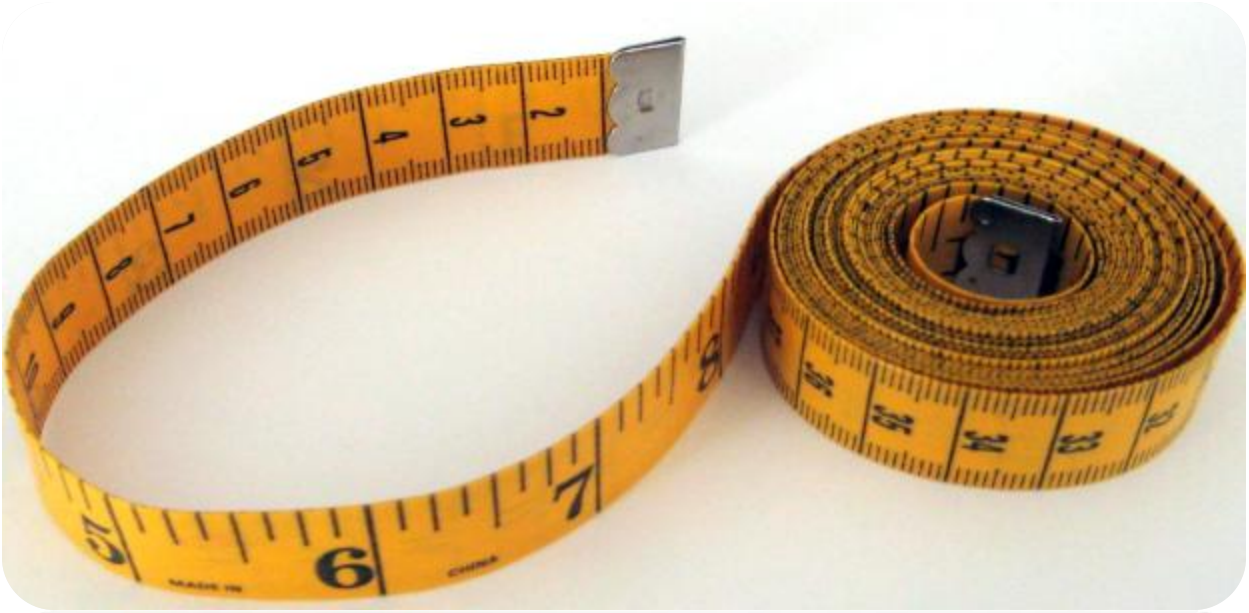
Contents

Unit one

Physical measurement.

Unit two

Motion in straight line.



Unit one
Physical measurement.

Chapter one
Physical measurement.

Chapter two
Vectors and scalars.

Chapter one

Physical measurement

Measurement

It is the process of comparing an unknown quantity with another quantity of its kind (called the unit of measurement) to find out how many times the first includes the second.

Types of physical quantity

Fundamental Physical Quantities	Derived Physical Quantities
They are physical quantities that cannot be defined in terms of other physical quantities.	They are physical quantities the can be defined in terms of the fundamental physical quantities.
Length – Mass – Time	Volume – Speed –Acceleration

Tools of measurement

Length	Mass	Volume
1- Meter Tape. 2- Vernier Caliper. 3- Ruler. 4- Micrometer.	1- Roman Scale. 2- Analog Scale. 3- Beam Balance. 4- Digital Balance.	1- Hourglass. 2- Stopwatch. 3- Clock. 4- Digital Watch.

Measuring Units

	The French system (C.G.S)	The British System (F.P.S)	The Metric System (M.K.S)
Length	Centimeter	Foot	Meter
Mass	Gram	Pound	Kilogram
Time	Second	Second	Second

International System of units (SI Units)

The Physical Quantity	The international Units
Length(L)	Meter(m)
Mass(M)	Kilogram(kg)
Time(t)	Second(s)
Electric current intensity(I)	Ampere(A)
The absolute temperature(T)	Kelvin(k)
Amount of material(n)	Mole(mol.)
Luminous intensity(I_v)	Candela(cd)
Angle measurement	Radian
Solid angle measure	Steradian

Standard (Length) meter

It is the distance between two engraved marks at the ends of a rod made of Platinum and Iridium alloy kept at 0^oC, at the international bureau of weights and measures near Paris.

The Standard Time (Second)

The Second = 1/86400 of the average solar day

The Standard Mass (Kilogram)

It is the mass of a cylinder made of Platinum and Iridium alloy of specific dimension kept at 0^oC,at the international bureau of weights and measures near Paris.

- **Give reason for:**

  Platinum and iridium alloy used in the standard unit?

  Because 1- It is rigid. 2 - Chemically inactive. 3 - Not affected by surrounding temperature contrary to other materials such as glass.

Write the scientific term:

1-The mass of a cylinder made of platinum and Iridium alloy of specific dimensions kept at 0°C, at the international Bureau of weights and measures near Paris. (……..….)

2- It is the distance between two engraved marks at the ends of a rod made of Platinum and Iridium alloy kept at 0°C, at the international bureau of weights and measures near Paris. (…….)

3-The Second = 1/86400 of the average solar day.(…….)

Choose the correct answer:

1- …… is a derived physical quantity.

a- Length. b- mass. c- velocity.

2- In the international system unit, the ampere is the unit of…….

a- Electric current intensity. b- electric charge. c- luminous intensity.

3- The unit of solid angle measure is ……..

a- radian. b- steradian. c- kelvin.

Compare between:

Fundamental Physical Quantities	Derived Physical Quantities

Give reason for:

1- Glass is not used in the standard unit.

……

……

2- Length is a fundamental quantity.

……

……

3- Velocity is a scalar quantity

……

……

Dimentional formula

Quantity	Rule	D.F	Unit
Length		L	M
Mass		M	Kg
Time		T	Sec
Area	length x length	L x L = L^2	m^2
Volume	length x length x length	L x L x L = L^3	m^3
Density	$\frac{M}{V}$	$\frac{M}{L^3} = ML^{-3}$.	$Kg.m^{-3}$
Velocity			
Acceleration			
Force	m x a		
Work	F x d		
K.E	½ m v^2		
P.E	m g h		

Use the dimensional formula to verify the following laws:-

1- Work = ½ mv^2, Where (m) is the object mass and (v) is its velocity.

……

……

……

……

2- F=m/a, Where (m) is the object mass and (a) is its acceleration.

……

……

……

……

3- v^2 = a x d, where the (v) velocity, (a) acceleration and (d) displacement.

……

……

……

……

If $E = mv^2$ Find:

1- D.F = ……

2- Unit = ……

Choose the correct answer:-

1- Dimensions of force are …… (F=ma)

($M.L^2.T^{-1}$, $M.L.T^{-2}$, $M^2.L^2.T^{-2}$)

2- Dimensions of work are …… (W = Fd)

($M.L.T^{-1}$, $M.L.T^{-2}$, $M.L^2.T^{-2}$)

3- The dimensional formula of a physical quantity is M0L0T-1, the measuring unit of this quantity is……

(kg.m/s , s^{-1} , kg.m.s)

Prefixes

Factor	10^{-9}	10^{-6}	10^{-3}	10^{-2}	10^{3}	10^{6}	10^{9}
Prefix	nano	Micro	Milli	Centi	Kilo	Mega	Giga
Symbol	N	µ	M	C	K	M	G

Write down the following values in a scientific form ($10^{\pm x}$):-

1- The ant mass = 0.001 kg = ……

2- The number of seconds in a day = 86400s = ……

3- $3x10^{-9}$ s = ……..……ms

4- 88 km = ……...m

5- The density of gold =19300kg/m^3 = …….kg/m^3.

6- The radius of a hydrogen atom = 0.0000000005m = ……..……

Error in measurement

Reasons of measurement error:-

1- Choosing improper tool
2- A defect in the measuring tool
3- Wrong procedure
4- Environmental conditions, such as:- (Temperature, Humidity, air currents)

Types of measurement

Direct Measurement	Indirect Measurement
One measuring tool is used.	More than one measuring tool are used.
No mathematical relation is applied.	A mathematical relation is applied to find the quantity.
One measurement error may occur.	More than one measurement error may occur.
Like measure the density by using hydrometer.	Like measure the density by measure the mass and volume.

Calculation of error in direct measurement

In direct measurement

Absolute Error (ΔX)	Relative Error (r)
It is the difference between the real (actual) value (X_o) and the measured value (X)	It is the ratio between the absolute error (ΔX) to the real value (X_o).
$\Delta X = \lvert X_o - X \rvert$	$r = \Delta X / X_o$

In indirect measurement

Add, Subtract	Times, divide
$(\Delta x = \Delta x_1 + \Delta x_2)$	$(r = r_1 + r_2)$

Choose the correct answer:

1. A student measured the length of a wooden bar. It was found to be 50.2cm, while the real value is 50cm. so the absolute error = ……
   a- 50cm. b- 0.2cm c- 0.04cm.
2. The …… is used to measure the density of liquid directly.
   a- Graduated cylinder. b- hydrometer. c- micrometer.

What is meant by:-

1. The Absolute error in measuring the wall length = 5 cm.
   ……
   ……
2. The relative error in measuring the distance between two buildings = 0.02.
   ……
   ……

Drills:-

1- If the length of a wall is 5m when a student measures its length he measured 5.5m find the relative and absolute error.
……
……

2- If the relative error of pencil length is 0.01 and its absolute error is 0.3cm find its real length and its measured value may be measured.
……
……

3- **Find** the relative error in measuring the volume of cuboid if the results of measuring its dimensions are as follows:-

Dimension	Measured quantity(cm)	Real quantity (cm)
Length(x)	5.2	5.23
Width(y)	4.5	4.56
Height(z)	2.9	2.95

……
……
……

4- An rectangular of length (6 m ± 0.1 m) and width (5 m ± 0.2 m) **Calculate** the error in measuring its Area of rectangular. (Area = Length x Width)
……
……
……

Chapter Two

Vectors & Scalars

Scalar Quantity	Vector Quantity
It is a physical quantity that can be fully defined by its magnitude only, it has no direction.	It is a physical quantity that can be fully defined by both magnitude and direction.
Examples 1 - Distance. 2 - Speed. 3 - Time. 4 - Mass. 5 - Energy. 6 - Temperature.	**Examples** 1 - Displacement. 2 - Velocity. 3 - Acceleration. 4 - Force.
Distance	**Displacement**
It is the length of the path moved by an object from a position to another.	It is the length of the straight line segment in a given direction between the starting points to the end point.
Scalar quantity	Vector quantity

Resultant force

It is a single force that produces the same effect on an object as that produced by the original acting forces.

- **Adding vectors if Θ = 90°**

  $A + B = C \quad A^2 + B^2 = C^2 \quad c = \sqrt{A^2 + B^2}$

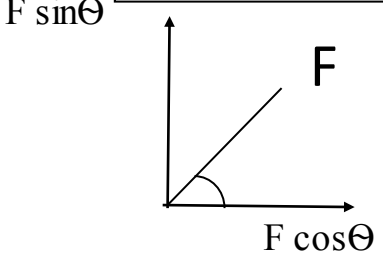
- **Product of vector:**

  Scalar product: $A.B = AB \cos \Theta$

  Vector product = $A \wedge B = AB \sin \Theta \, n$

(n) is the direction of the new vector which ⊥ to the plane and can be got by (right hand rule).

- **Resolution:**



What is meant by:

1- The displacement of a body is 50 m.

……..

2- The distance covered by the body =10 m.

……...

Write the scientific term:

1- That defined by its magnitude only. (……)

2- Single force that results the same effect on the object as that produced by the original acting force. (……)

3- The change in the position of an object. (……)

Give reason for:

1- Velocity is a vector quantity.

……

……

2- Distance is a scalar quantity.

……

……

When does ……?

1. Displacement of an object equal to the distance it covered.

……

2. Displacement of an object equal to zero in spite of its motion.

……

3. Scalar product = vector product.

……

4. Scalar product = 0.

……

5. Vector product = max.

……..

6. The difference between to vectors = 0

……..

Compare between distance and displacement.

Distance	Displacement

Problems:

1- Find the resultant of two forces; one of them (F_x = 4 N) acting in x- dimension, while the other (F_y = 3N) acting in y- dimension.

……
……
……

2- The magnitude of two vectors A and B are 5 and 10 respectively and the angle between them is 60o find the result of each of:
1- A. B 2- A ∧ B

……
……
……

3-Mohamed leaves the school and hikes 11 km, north and then hikes 11 km east. Determine Mohamed's resulting displacement.

……
……
……..……..

4- A tines ball falls from a height of 20 m then rebounded to upward 4m, find its distance and displacement.

……
……
……

5- If the vector X is 3 and vector Y is 5 and these vectors making angle 60° between them find: a. Vector product with the direction. b. Scalar product.

……
……
……

6- A body moved in a circular motion of radius (r) find its displacement and distance when the body: a. Makes one complete cycle. b. Moves half cycle.

……
……
……

Unit Two

Motion in st. line

Chapter one

Motion in st. line

Chapter two

Motion with unif. acc.

Chapter Three

Force and motion

Chapter One — Motion in st. line

Translational motion	Periodic motion
The motion which has starting point and end point.	The motion that repeats itself in equal interval of time.
Motion in straight line.	Motion in circle.

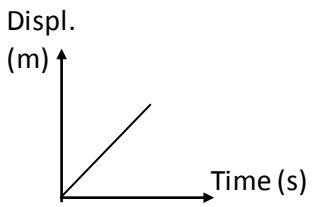
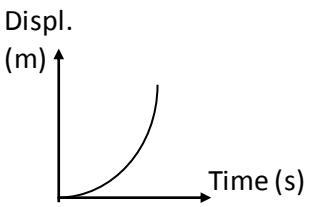
Velocity

the rate of change of displacement.

Or: the displacement of an object in one second.

Velocity	Speed
The displacement of an object in one second.	The distance of an object in one second.
Vector quantity.	Scalar quantity.
Defined by its magnitude only	Defined by magnitude and direction.

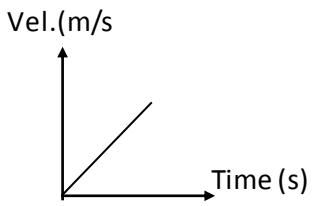
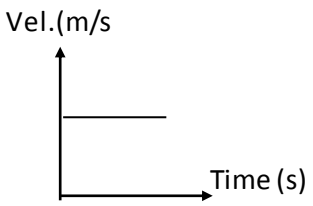
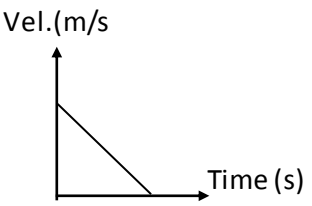
Types of velocity

Uniform velocity	Non uniform velocity
At which the objects moves through equal displacements in equal interval of time.	At which the objects moves through unequal displacements in equal interval of time.
	

Acceleration

It is the rate of change of velocity.

Or: The change of the object velocity per unit time.

Positive acceleration.	Zero acceleration.	Negative acceleration.
When the velocity increase.	When the velocity is constant.	When the velocity decrease.
		

Give reason for:

1- Fan motion is a periodic motion, while the train motion is a transitional motion.

……

……

……

2- Average velocity may be equal to the instantaneous velocity.

……

……

……

3- When a body moves with constant velocity its acceleration = zero.

……

……

……

Write the scientific term:

1- Distance moved by the object per unit time and scalar quantity.

(……...)

2- Motion in which velocity changes with time. (……)

3- At which the objects moves through equal displacements in equal interval of time. (……)

What is meant by:

1- A car moves at uniform acceleration =-4 m/s^2.

……

……

2- An object is displaced 20 m in 4 sec.

……

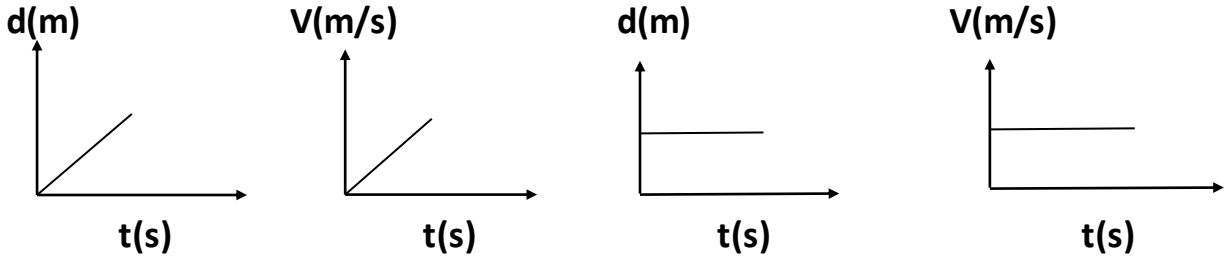
……

3- The velocity of an object increases at a rate 4 m/s every 1 sec.

……

……

Describe the kinematic state of the object and mention what the slope of the line equals in each graph:-



Problems:

1- Calculate the average velocity in(km/h) unit if a tracker cutting a distance (4000m) in (30min.) then calculate the distance cutting after (45min.) from the starting point with same velocity.

……

……

……

2- The table below illustrates the relation between velocity of an object and time:

V (m/s)	5	10	20	30	A	40
T (s)	1	2	4	6	7	8

a- Plot the graph between vel. On vertical axis and time on horizontal axis:

b- From the graph find:

1) The value of A.
2) The velocity of the object at the 5^{th} sec.
3) The acceleration of motion and its type.

Chapter Two — Motion with uniform acc.

1st equation of motion

$$a = \frac{\Delta V}{t}$$

$$a = \frac{V_f - V_i}{t}$$

$a\,t = V_f - V_i$

$$V_f = V_i + a\,t$$

2nd equation of motion

$V_{av} = \frac{d}{t}$ $\quad\quad$ $\because V_{av} = \frac{V_f + V_i}{2}$

$$\frac{V_f + V_i}{2} = \frac{d}{t}$$

$2d = (V_f + V_i)\,t$

From 1st eq. $(V_f = V_i + at)$

$2d = (V_i + at + V_i)t$

$2d = (2V_i + at)\,t$

$$d = V_i\,t + \frac{1}{2}at^2$$

3rd equation of motion

$V_{av} = \frac{d}{t}$ $\quad\quad$ $d = v_{av.}\,t$

$\because V_{av} = \frac{V_f + V_i}{2}$

From 1st eq. $t = \frac{V_f - V_i}{a}$

$$d = \frac{V_f + V_i}{2}\ x\ \frac{V_f - V_i}{a}$$

$2ad = (V_f + V_i)\,(V_f - V_i)$

$2ad = V_f^2 - V_i^2$

$$V_f^2 = V_i^2 + 2ad$$

Free fall

Free fall acceleration (g)

It is the uniform acceleration by which objects move during free fall towards the ground.

3 eq. of motion	**Vi = 0**	**Vf = 0**
$V_f = V_i + gt$	$V_f = gt$	$V_i = - gt$
$D = v_i t + 1/2\ g\ t^2$	$D = 1/2\ g\ t^2$	$D = v_i t + 1/2\ g\ t^2$
$V_f^2 = V_i^2 + 2\ g\ d$	$V_f^2 = 2\ g\ d$	$V_i^2 = - 2\ g\ d$

Projectiles:

a) Upward:

$V_f = 0$, g= -10 m/s^2,

b) Downward:

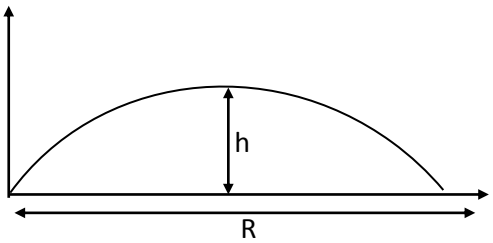
$V_i = 0$, g= 10 m/s^2,

C) With angle:

$V_{ix} = V_i \cos\theta$ ⇒ $V_{iy} = V_i \sin\theta$

1- $V_{fy} = V_{iy} + (-gt)$ ⇒ $0 = V_{iy} - gt$

$V_{iy} = gt$ ⇒ $t = \frac{V_{iy}}{-g}$



Time of flight (T) = 2t = $\frac{2\,V_{iy}}{-g}$ (1)

2- $V_{fy}^2 = V_{iy}^2 + 2gh$

$0 = V_{iy}^2 + 2gh$, $V_{iy}^2 = 2gh$ ⇒ $h = \frac{V_{iy}^2}{-2g}$ (2)

3- $R = V_{ix}\ 2t = V_{ix}\ T$ (3)

Choose:

1- The dimensional formula of acceleration …….

a) LT^{-1} b) LT^{-2} c) $L^{-1}\ T^{-2}$ d) $L^{-2}\ T^{-2}$

2- When the change of velocity equal zero ,……

a) a is negative. b) a is positive. C) a = 0 d)body at rest.

3- If the direction of velocity and acceleration is negative ……..

a) Velocity increase. b) Velocity decrease.

c) Velocity is constant. d) body stopped.

4- Two different objects have the same volume falls together from the same height which of these statement is correct:

a) The heavier reaches ground first b) The lighter reach first.

c)acceleration of the heavier is bigger. d) reaches ground together.

What is meant by:

1- Displacement of a table is 3m?

……

……

2- Velocity of a bike = 5m/s?

……

……

3- Acceleration of gravity = 9.8 m/s^2?

……

……

Give reasons for:-

1- When an object falls freely from rest, its velocity increases.

……

……

……

2- The acceleration due to gravity may be positive or negative.

……

……

……

When does each of the following values equal zero?

1- The velocity of a body projected vertically upwards.

……

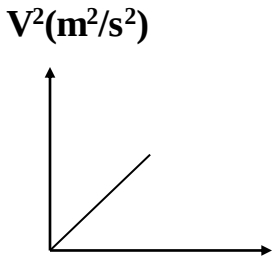
……

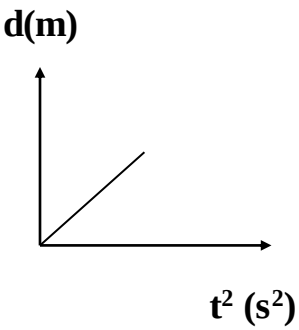
2- The horizontal component of initial velocity of a projectile.

……

……

Write the mathematical relation for each graph of the following and state what the slope of each line represents:-





Problems:

1- An object moves in a straight line according to the relation: $V_f^2 = 36 - 4d$,

Find: a. The acceleration of the object motion.

b. The time taken to stop.

……

……

……

2- A driver saw the red traffic light when he was moving at 80Km/h, at 100m away from the car. He used the brakes to decelerate at $2m/s^2$.

a. Would the car cross the traffic sign?

b. Calculate the time taken by the car to stop.

……

……

……

……

3- In an experiment to determine the acceleration due to gravity using falling water drops, the distance between the tab and the plate base is (1m), If the time taken by 100 drops is 45s, **Find** the acceleration due to gravity.

……

……

……

4- An object is projected vertically upward at velocity 147 m/s . if the free fall acceleration is 9.8m/s^2 ,find:

1- The object6 velocity after 5sec from projection.

2- The maximum hight reached by the object.

3- The total time taken by the object to return back to the point of projection.

……

……

……

5- A projectile is projected from a canon at a velocity of 800 m/s at an angle 30° to the ground, **Find**:

a. The maximum height reached by the projectile.

b. The horizontal range reached by the projectile.

……

……

6- A motorcycle is launched at 15 m/s in a direction that makes an angle 30^o to the horizontal, **Find**:

a.The maximum height reached by the motorcycle.

b.Time of its flight.

c.The horizontal range reached by the motorcycle.

……

……

……

7- Person projected object from high building with velocity (50m/s) if the acceleration due to gravity is (10m/s^2) calculate the velocity and the displacement moved by the object after (4s) in the following cases:

a) If projected vertically upward.

……

……

b) If projected vertically downward.

……

……

c) If it projected with angle 30^o with horizontal plane.

……

……

d) If it projected with angle zero with the horizontal plane.

……

……

Chapter Three

Force and motion

Force

It is an external influence that affects the object to change its state of motion or direction.

Newton's firs law

A static object keeps its state of rest and a moving object keeps its state of motion at a uniform velocity in a straight line unless acted upon by a resultant force.

$\sum F = 0$

Inertia

The tendency of an object to keeps either its state of rest or state of motion at its uniform velocity in straight line.

OR: the resistance of object to change its static or dynamic state.

Newton's second law

The resultant force affecting on object equals to the rate of the change in the object's momentum (motion amount).

OR: When a resultant force acts on object, the object acquires an acceleration which is directly proportional to the resultant force and inversely proportional to the object mass.

Momentum

The velocity and the mass are related to a physical quantity known as:

Momentum = Mass × Velocity

Mom. = m × v

The measuring unit of momentum is: **Kg.m/s**

Factors that affect the momentum

1 – Mass 2 – Velocity

$$F = \frac{\Delta P}{\Delta T} = \frac{mV_2 - m\,V_1}{\Delta T} = \frac{m\,(V_2 - V_1)}{\Delta T} = m\ x\ a$$

Newton:

It is the force that when acts on an object of mass1 kg accelerates it at 1 m/s^2

F = m x a N = kg. m /s^2 Dimensional: M L T^{-2}

Mass	Weight
The resistance of an object to change its dynamic state.	The force of gravity acting on a body.
Fundamental, scalar.	Derived, vector (to the center of the earth)
$M = \frac{F}{a}$	W = m x a
Kg	Newton
Constant at everywhere.	Changed from position to another.

Newton's third law

When an object acts on another object by a force, the second object reacts with an equal force on the first object in a direction opposite to that of action.

Or: every action has reaction equal in magnitude and opposite in direction.

Choose:

1- When the resultant force acting on moving object is zero, the object……..

a- Stops motion. c- Moves at uniform velocity.

b- Moves at non uniform velocity. d- Moves at uniform acceleration.

2- The mathematical formula that expresses Newton's third law ……..

a- $F_1 = -F_2$ b- $F = m \times a$ c- $\Sigma F \neq 0$ d- $\Sigma F = 0$

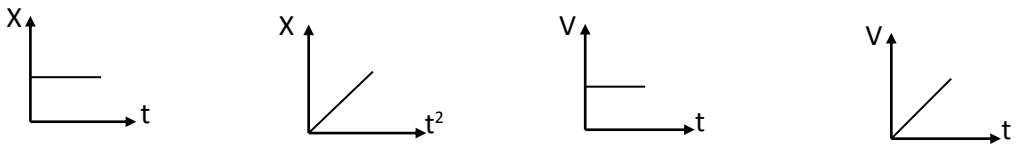
3- A car moving with uniform velocity in straight line to east when the resultant force on the car ……..

a- Zero. b- -ve c- + ve d- to east.

4- When an abject projected vertically with v_i with an angle 60^o with the horizontal plane so it cover horizontal distance R, to reach distance farther than this starting with same velocity we have to project it with angle equal……..

a- 90^o. b- 75^o. c- 45^o. d- 30^o.

5- The graph which represents motion of body with uniform velocity?



a- b- c- d-

Give reason for:

1- Passengers in the bus fall forward when it stops suddenly.

……

……

2- A space rocket does not need to consume more fuel after being moved away from the earth's gravity.

……

……

3- The rotation of fan after turn off the current.

……

……

4- Force is a vector quantity.

……

……

5- The objects weigh on earth is greater than its mass.

……

……

6- No single force could exist in the universe.

……

……

Problems:

1- A static object of mass 20kg is affected by a force 30N. find:
   a- The acceleration acquired by the object.
   b- The time taken by the object to move a distance of 75m.

……

……

……

……

2- A body of weight 240N was moving at velocity of 25m/s. two seconds later, its Velocity becomes 40m/s. assuming that the free fall acceleration=10m/s^2 find the force acting on the body.

……

……

……

……

3- A static body of weight 400N was acted upon by a force 200N. giving that the body moved for 3s. and the free fall acceleration=10m/s^2, calculate:
   a- The final velocity after 3s.
   b- The distance covered in 3s.

……

……

……

Write down the scientific term:-

1- The force that when acts on an object of mass 1 kg accelerates it at (1) m/s^2. (……..)

2- The attraction force of Earth to the body. (……..)

Give reasons for:-

1- Passengers in a bus tend to fall forward when it suddenly stops.

……

……

2- The action and reaction may not lead to equilibrium.

……

……

When does each of the following happens:

a. Force acting on object equals its mass.

……

b. The object move in straight line with uniform speed.

……

Drill:-

1. A car was pulled by a force 1000N to move it at acceleration 5 m/s^2, **Find** the mass and the weight of the car (Given that g = 9.8 m/s^2)

……

……

……

2. A car pushes a box of mass 20 kg with a force 50 N, **Calculate** the acceleration of the box.(Assume that there is no friction)

……

……